What Happens When Recommendation System Meets Reputation System?
The Impact of Recommendation Information on Purchase Intention

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Abstract
Recommendation systems are intended to increase consumer purchasing intentions and may enhance consumers’ experience value via personalized service. This study investigates how recommendation system and reputation system simultaneously affect customer purchase intention from an information communication perspective. A laboratory experiment was conducted to test the research framework which was proposed based on the social influence theory and the theory of reasoned action. The results demonstrate that consumer purchase intention is primarily affected by consumer attitude toward the purchase of the recommended product, and this attitude is driven mainly by the relevance to personal interests while also being affected by the external subjective norm regarding the purchase of the recommended product. This study also finds that the online feedbacks of reputation system exert a significant influence on the formation of external subjective norms. The results of this study provide useful insights into how recommendation information affects consumers’ attitude and purchase intention.

1. Introduction
Shopping online has become the norm among the majority of consumers because it is convenient and easy to order through a simple “click.” However, compared with brick-and-mortar stores, in the online setting there is no human face to help customers making shopping decisions by providing services such as personal recommendation, professional product knowledge, and alternative product support. Hence, for most consumers the image of the e-clerk (or shopping cart) on a commercial website may be stereotypically unenthusiastic and unfriendly. This shortcoming prevents a large number of consumers from shopping online. Recently, experiential marketing has become an innovative service strategy to enhance customer satisfaction and loyalty in brick-and-mortar store [5, 40]. Traditional marketing views consumers as rational decision-makers who care about functional features and benefits. In contrast, experiential marketers view consumers as rational and emotional human beings who are concerned with achieving pleasurable experiences [29]. Therefore, how to enhance customers’ pleasurable experience of shopping online is a new challenge for e-stores.

The rapid increase in the availability of products and information on the Internet has created a new problem. Instead of lacking alternatives, people now have to spend considerable effort in filtering and processing huge information. Overcoming information overload thus has become a key issue in searching for information. As a result, many e-stores have built recommendation systems and reputation systems to help consumers reduce search costs [22, 37]. For instance, eBay.com designed online feedback mechanisms to enable buyers and sellers to share their previous shopping experiences. Moreover, amazon.com recommends specific products to members based on their purchase history, and provides an online feedback mechanism in which all consumers can share opinions and experiences to reduce uncertainty regarding quality. Successful recommendation systems may effectively predict customers’ interests. This innovative mechanism not only provides customers with a personalized service, but also enhances customer loyalty [42]. However, many e-stores provide both recommendation system and reputation system at the same time. Hence, we argued that the effects of these two mechanisms may be inter-influenced by each other. In light of this, it is important to understand the interaction effects between recommendation system and reputation system on consumers’ purchase intention.

Recommendation systems (also known as recommender systems) generate personalized messages to persuade consumers to buy recommended products
while surfing or shopping [19, 41]. A recommendation system frequently provides recommendation information to users based on user demographics, item features, and/or user preferences [39]. Through providing this service, e-stores can increase not just sales but also consumer loyalty. Reputation systems that differ from traditional word-of-mouth networks use the bidirectional communication capabilities of the Internet to artificially engineer large-scale word-of-mouth networks [10]. This digitized word-of-mouth can help consumers reduce uncertainty regarding quality, and may help build trust between different parties in online markets [3, 22]. Although reputation systems are similar to collaborative-filtering based recommendation system in that both collect ratings from consumers, they differ in assuming that all consumers in a community should make consistent judgments regarding product or service quality [17].

Whether for recommendation systems or reputation systems, the content of system output could be referred to as recommendation information (Figure 1). In this study, the recommendation information generated by recommendation system is named system recommendation information (abbreviated to SRI). On the other hand, the recommendation information generated by reputation system is named peer recommendation information (abbreviated to PRI). Similar to advertising, recommendation information informs and persuades consumers to take an interest in or buy recommended products [30]. However, unlike traditional advertisements, e-stores provide consumers with recommendation information based on consumer interactions with e-store. From an information processing perspective, consumers may not understand how SRI was generated by recommendation system, because the recommendation approach (i.e. algorithm) of a specific recommendation system is a black box to consumers. Consumers use SRI as a basis for deciding whether to buy recommended products. Meanwhile, online feedback is provided by other consumers instead of e-store himself, but most consumers consider PRI when they are evaluating a recommended product. Therefore, a consumer's cognition regarding recommended products is influenced simultaneously by both SRI and PRI when she/he is shopping online.

This study investigates the effects of recommendation system and reputation system on consumer purchase intention of recommended products from an information communication perspective. Since purchase behaviors are likely to be influenced not only by personal needs but also by social influence [12], this study applies a theoretical framework in which the information processing model and social-psychological forces are integrated with the theory of reasoned action (TRA) [2]. Furthermore, a laboratory experiment was conducted to examine the persuasiveness of the recommendation information generated by both experimental recommendation system and reputation system.

The remainder of this paper is organized as follows. The next section analyzes the content of recommendation information on current e-stores and discusses the literature on information processing and social influence theory. Research model and research hypotheses are then presented in the third section. Subsequently, the fourth section describes the experiment procedures and the results of statistic analyses. Finally, the final section summarizes the study findings and discusses future research directions.

2. Effect of recommendation information on purchase process

Recommendation information takes the form of persuasive messages composed of personalized explanation argument and non-personalized information, including product descriptions, consumer reviews, and consumer comments. To understand the persuasive effect such information exerts on consumers, the content of recommendation information is discussed as follows.

2.1. System recommendation information

Consumers are more likely to favor recommended products if they understand the logic behind the recommendation [31]. Since SRI is recommended by
internal recommendation system embedded in an e-store, providing an explanation of particular recommendation will increase system transparency and thus consumer trust [38]. Product descriptions (i.e. product name, producer, price, and the other attributes) are a part of SRI. Although product descriptions are the intrinsic information of the recommended product, its contents are not personalized. That is, the contents of statement are constant for every consumer at the same time. Consumers evaluate each feature of recommended product to judge whether the product fits their interests. As a result, consumers perceive the degree of personalization of recommendation systems based on the explanation argument and product descriptions of the recommended products. Chen et al. [8] did not consider the persuasive effect of recommendation content matches user preferences, the user is more likely to process the content and accept the offer.

2.2. Peer recommendation information

In addition to SRI, PRI (i.e. consumer reviews and comments on reviews) is another important aspect of recommendation information. Consumers can share their opinions and experiences regarding a product via reputation systems (digital word-of-mouth). These PRI are helpful to other consumers in the process of making a purchase decision [10, 23]. Consumers may trust PRI by known and even unknown members of virtual communities in judging a product [35].

Since both recommendation systems and reputation systems can provide valuable recommendation information and reduce search costs, many e-stores have adopted both systems simultaneously. To investigate the effect of recommendation information, it is necessary to simultaneously consider the effects of both SRI and PRI. Chen et al. [8] examined the effect of both consumer feedback and retailer recommendations and found that more recommendations improve sales. They also found that a positive association exists between number of consumer reviews and sales, but that no such association exists for consumer ratings. However, Chen et al. [8] did not consider the persuasive effect of SRI. Recommendation systems work on the premise that consumers recognize the value of SRI. Therefore, this study investigates the interaction effects between SRI and PRI from a communication perspective.

2.3. Social influence

Individual behavior is influenced by other members of the social groups to which the individual belongs. This phenomenon has been identified and defined as social influence, and comprises two types, informational social influence and normative social influence [11, 16]. Informational social influence was defined as the “influence to accept information obtained from another as evidence about reality,” and normative social influence was defined as the “influence to conform to the expectations of another person or group” [7, 11]. Informational social influences are accepted if an individual sees the information as useful for problem solving. Since information overload has become a critical challenge for online consumer, providing recommendation information suggesting that consumers purchase particular products is a kind of informational social influence. This influence may lead consumers to accept the online feedback of other consumers regarding specific products [26]. Besides informational social influence, consumers may also be influenced by normative social influence. Normative social influences act via either compliance or identification. Due to the behavior a consumer purchased products in an e-store is invisible or unknown to others, compliance would not occur [7]. However, consumers accept the influences of referent by associating themselves with the referent in a type of identification process. Normative social influences thus occur if consumers perceive information presented by other consumers who are significant referents for themselves.

3. Research model and hypotheses

E-stores provide SRI generated by recommendation systems to make customers aware of products that may be relevant to their interests. However, consumers tend to consider PRI generated by other consumers in addition to SRI to reduce uncertainty regarding the quality of recommended products. Therefore, the manner in which consumers’ process recommendation information affects their purchase decision.

3.1. Antecedents of purchase intention

Recommendation systems are designed to increase sales. This study thus examines the effectiveness of these systems by focusing on purchase intention for recommended products, assuming that it is a predictor of consumer purchase behavior. Based on TRA, consumer purchase behavior is determined by their purchase intention, which in turn is determined by both attitude toward the purchase behavior and the subjective norm regarding the behavior. This study defines purchase intention as the strength of consumer intention to purchase a recommended product. Meanwhile, attitude toward the purchase of the recommended product is defined as the strength of consumer positive feelings about the purchase of the
recommended product. Since individual intention to perform a behavior can be predicted by their attitude toward the behavior [2], hypothesis 1 is proposed:

H1: More favorable attitude toward the purchase of the recommended product will lead to stronger intention of purchasing the recommended product.

The subjective norm construct is defined as perceived social pressure (from cohesive referents such as family, friends, colleagues and boss) to perform or not perform a behavior [1]. However, online shopping is usually a private behavior. Individuals generally perceive only slight social pressure generated by cohesive referents when they are shopping online. Other consumer behaviors, including purchasing or commenting on recommended products, may act as referential information for individuals, especially under conditions of insufficient information [12]. Song and Kim [32] argued that cohesive referents may not be powerful referents in online purchasing environments and extended the concept of internal referents to external referents to explain the influence of virtual communities. Moreover, Song and Zahedi [34] found that external subjective norms positively influence online purchase intention.

Since the purpose of this study is to investigate possible influences on consumer purchase intention during the elaboration of recommendation information, it adopted external subjective norm rather than the subjective norm originally proposed in TRA to predict consumer attitudes toward the purchase of the recommended product and purchase intention. This study defines external subjective norm as the perception of an individual consumer that most external referents who are believed to be familiar with and to have used the recommended product think they either should or should not purchase the same product [6, 18, 34]. Besides attitude toward product purchase, we argued that external subjective norm is an important antecedent to purchase intention of the recommended product. Hence, we hypothesize:

H2: Greater perceived external subjective norm will lead to stronger intention to purchase the recommended product.

3.2. Attitude formation

Attitudinal and normative variables are discussed separately in TRA [13], but attitudes are often reframed as norms [6]. Previous studies found that subjective norms influence attitude through social influence processes [21]. The stronger the motivation of consumers to conform to group norms, the more group behavior influences their attitudes [20]. Hence, we hypothesize that external subjective norm will influence attitude toward the purchase of a product. Consequently, hypothesis 3 is proposed as follows,

H3: Greater perceived external subjective norm will lead to more favorable attitude toward the purchase of the recommended product.

People may accept information from others as evidence about reality [7]. Based on social influence theory, informational social influence occurs when a consumer accepts recommended information as evidence regarding the utility of a purchase. Since consumers face quality uncertainty when shopping online, SRI generated by recommendation systems provides consumers with useful product information. The contents of explanation argument and product descriptions persuade consumers that recommended products as relevant to their interests. If consumers perceive recommended products as relevant to their interests after deliberating the SRI, they will favor those products. In this study, relevance to personal interests is defined as the degree to which a consumer is interested in the recommended products. Therefore, consumers will have a favorable attitude toward the purchase of a product when they perceive SRI as informative and personalized. This leads to the hypothesis 4.

H4: Greater relevance to personal interests will lead to more favorable attitude toward the purchase of the recommended product.

Besides relevance to personal interests, online reviews provide consumers with relevant information about the quality of recommended products. Consumers may accept the online feedback of other consumers for product evaluation [26]. For example, epinions.com encourages members to rate products and to evaluate the reviews of other members. These quantitative ratings and qualitative reviews provide consumers valuable information for judging products [43]. Therefore, this study argued that online reputation influences consumer attitude toward the purchase of products via informational social influence. Hypothesis 5 thus is proposed, as follows.

H5: More positive online review will lead to more favorable attitude toward the purchase of the recommended product.
3.3. External subjective norm formation

An external normative social influence occurs if a consumer perceives that information has been presented by other consumers who are significant referents for himself [18]. Consumers will perceive social pressure to purchase or not purchase a product when they receive feedback from other consumers. If consumers feel that a product which is popular among the virtual community is suitable for them, they will believe that other consumers expect them to purchase the product. Moreover, consumers tend to purchase products that are popular, while refraining from purchasing those that are unpopular. This phenomenon suggested that online reputation influences consumers through a mechanism based on social influence. Hence, we hypothesize:

\[ H6: \text{More positive online review will lead to greater external subjective norm regarding purchase of the recommended product.} \]

4. Experiment design and data analysis

4.1. Experiment and subjects

A laboratory experiment was conducted to measure the effect of recommendation information. Thirty students and 18 employees from a university in Taiwan agreed to participate in this study. Every subject gained a reward of $6 US dollars as a participation incentive. Table 1 lists subject demographic information. All subjects were given a $3 discount coupon to buy a movie DVD in an experimental e-store. All subjects had to register and score ten movies before logging into the experimental e-store in order to predict each subject’s preferences. After subjects logged in, recommendation information was generated based on the subject’s interests. Five recommended movie DVDs were provided, the online reviews of which had been manipulated. All subjects have to fill out the questionnaire for each recommendation. A total of 240 recommendations were evaluated.

Every recommendation is composed of explanation argument, product descriptions, and online review. Explanation argument is generated based on the scores of each subject for the ten sample movies. Furthermore, online review is manipulated by different content ratings, including qualitative textual reviews and quantitative symbolic rating. The content rating scheme was designed as follows: 5 stars = highly valuable, 4 stars = somewhat valuable, 3 stars = neutral rating, 2 stars = somewhat worthless, and 1 stars = worthless [27].

4.2. Analysis results

Partial least square (PLS) was used for data analysis because it makes minimal demands in terms of sample size and residual distribution while validating a model [9]. The validity of multiple-item constructs was assessed in terms of content validity, convergent validity, and discriminant validity. The items used to measure research constructs were developed based on previous studies [4, 18, 24, 33]. All constructs were measured respectively by three reflective indicators except the online review. In addition, two senior professors were interviewed and a pilot-test was conducted to ensure the content validity of the instrument. A seven point Likert scale ranging from “strongly disagree” to “strongly agree” was used to measure each item. Subjects completed the questionnaire after they reviewed a relevant recommendation. Table 2 lists the composite reliabilities and correlations of the main constructs respectively.

| Table 2. Correlation matrix and average variance extracted for the principal constructs |
|-----------------------------------------------|-----------------|-------------|--------|-----|---|
| Constructs | Composite Reliability | RPI | ATT | ESN | PI |
| RI | 0.928 | 0.902 |
| ATT | 0.976 | 0.788 | 0.965 |
| ESN | 0.974 | 0.451 | 0.481 | 0.974 |
| PI | 0.967 | 0.764 | 0.908 | 0.443 | 0.952 |

Note: The shaded numbers in the diagonal row are square roots of the average variance extracted.

RPI: Relevance to personal interests, ATT: Attitude towards the purchase of the recommended product, ESN: External subjective norm, PI: Purchase intention

The convergent validity of each construct was assessed based on the factor loading of each item, composite reliability, and the average variance extracted [14, 15]. The first test was performed using confirmatory factor analysis. All items loaded well on their respective factors (above 0.79). As listed in Table 2, the composite reliabilities of each main construct exceeded the criterion of 0.70 [25], and all average variances extracted for these constructs exceeded the criterion of 0.5 [15]. Second, as listed in Table 2, the
square root of all AVEs exceeds all other cross correlations. Therefore, the findings indicate adequate convergent validity and discriminant validity. The standardized PLS path coefficients of the research model are shown in Figure 2. The statistical results demonstrate that consumer purchase intention regarding the recommended product is positively influenced by favorable attitude toward the purchase of the recommended product \((b = 0.904, p<0.001)\). H1 is supported significantly as it has been in many previous studies [6]. Although external subjective norm was not found to significantly influence purchase intention (H2 is not supported), attitude toward the purchase of the recommended product is significantly influenced by external subjective norm \((b = 0.165, p<0.01); H3 is supported significantly). This implies that external subjective norm indirectly affects purchase intention.

![Figure 2. PLS results for the research model](image)

Since H4 is supported \((b = 0.715, p<0.001)\) but H5 is not supported \((b = -0.016)\), consumer attitude toward the purchase of the recommended product is influenced by relevance to personal interests through informational social influence rather than being influenced by online review. On the other hand, external subjective norm is significantly influenced by online review \((b = 0.372, p<0.001); H6 is supported). Therefore, this study found that online review seems to influence attitude toward the purchase of recommended product through the normative social influence. Finally, it is important to stress the high degree of explained variance in both attitude toward the purchase of the recommended product \((R^2 = 0.641)\) and purchase intention \((R^2 = 0.824)\).

5. Discussions and conclusions

Previous studies have proposed that recommendation system and reputation system will influence consumer purchase behavior. Although recommendation system may recommend personalized products that are likely to be attractive to consumers, consumers may consider online review when making purchase decisions. This study proposed an exploratory framework to investigate the effect of both recommendation system and reputation system on purchase intentions regarding recommended products from an information communication perspective. The experimental results show that relevance to personal interests significantly leads to favorable attitudes toward the purchase of recommended products, and imply that recommendation system will intensify consumer attitudes toward the purchase of the recommended product if they perceived the recommended products as relevant to their interests. This finding is consistent with previous research by Tam and Ho [36] that was described earlier.

Moreover, this study found that the opinions of other consumers influence consumer attitudes toward the purchase of the recommended product via normative social influence. Most e-stores adopted product features, consumer profiles, and consumer preferences to predict consumer interests rather than online review. However, this study argued that recommendation systems should also consider online review to increase their persuasiveness to consumers. Hence, how to recommend products for consumers based on their preferences and other consumers’ opinions is an important issue for researchers and practitioners. Our findings also show that online review is not directly related to attitude toward the purchase of recommended products, even if it has been found to influence the behavior of traders in e-marketplace [10]. Finally, external subjective norm was not found to affect consumer purchase intention. This result indicates that external subjective norm does not play the same role as subjective norm in the TRA model. Therefore, the external subjective norm will not influence the purchase intention directly.

This study provided practitioners with insights into problems related to consumer behavior. Based on the intention model, consumer behavior can be predicted based on their intentions [1, 2]. The results of this study contribute to managerial understanding of consumer purchase intentions regarding the recommended product. Understanding the effect of recommendation systems and reputation systems has important implications for retailer strategies. Retailers must make efforts to manage consumer feedback, because the online feedback of a product will influence consumers’ willingness to make a purchase [28]. On the other hand, recommendation systems can filter personalized products from large catalogues to provide consumers with personalization services. Retailers can adopt this technology to improve sales [8].
managers of e-store can use recommendation systems to increase sales, they should manage reputation systems to avoid malicious competitors spreading the untruthful ratings or reviews. We suggest that e-stores may develop trust systems to build a cohesive social network. Since trust systems may strengthen ties among members, it may increase the impact of external referents on purchase decision. This issue will be discussed in the future study.

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References